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RESEARCH NOTE

Use of bovine-derived collagen matrix in the surgical treatment of empty nose syndrome

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KEYWORDS
augmentation turbinplasty, empty nose syndrome, ENS6Q, postoperative

Key points

- Bovine-derived collagen matrix (BDCM) is a safe augmentation material in patients with empty nose syndrome.
- BDCM augmentation results in clinically and statistically significant improvement in nasal symptoms.
- Improvements in nasal symptoms with BDCM augmentation may be durable and can be seen up to 2 years postoperative.

1 | INTRODUCTION

Empty nose syndrome (ENS) is a rare, complex, iatrogenic condition of the nasal airway stemming from excessive tissue loss of the inferior turbinates. These patients classically report paradoxical symptoms of nasal obstruction, feeling of suffocation, nasal burning, and/or dryness despite a patent nasal airway.[1] Submucosal grafting (augmentation turbinoplasty or AT) is offered for patients who do not get adequate symptomatic relief with medical therapies alone and represents a durable and effective treatment option. In this report, we describe our experience using bovine-derived collagen matrix (BDCM) in AT.

2 | METHODS

We retrospectively examined the medical records of 16 patients who underwent AT using BDCM for ENS. AT was performed under general anesthesia in the ambulatory surgery department. After submucosal infiltration with 1% lidocaine with 1:100,000 epinephrine in the area of planned augmentation, an incision was made in the mucosa and a submucosal pocket was created. Purified BDCM (Durepair, Medtronic; or Duramatrix, Styker) was cut into small strips and packed into this pocket until the desired amount of augmentation was achieved. The location and quantity of submucosal grafting were guided by in-office cotton testing so that the result of the grafting approximated the size and location of the cotton associated with the desired reduction in ENS symptoms.[2,3] The incisions were covered with Purasinus synthetic peptide gel (3-D Matrix Inc.) or Tisseel fibrin sealant (Baxter).

3 | RESULTS

Sixteen patients underwent AT and were included in analysis. Five patients underwent unilateral AT and the remaining 11 underwent bilateral AT. One patient had their implant solely in the inferior turbinate, one had their implant placed in both the inferior turbinate and in the lateral nasal side wall, one had their implant placed in both the lateral nasal side wall and nasal floor, and the remaining patients had their implants placed in the lateral nasal side wall exclusively.

At POV1 (mean of 3.8 weeks postoperative), there was a significant improvement in mean overall ENS6Q score (9.69 vs. 17.5, $p < 0.001$) as well as scores for "nasal dryness" (2.19 vs. 3.81, $p = 0.005$), "feeling of suffocation"

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TABLE 1 Mean preoperative and postoperative ENS6Q scores after inferior turbinoplasty.

	Pre-operation ($n = 16$)	First POV	Difference (SD)	p-value	Final POV ($n = 9$)	Difference[a] (SD)	p-value
Overall	17.5	9.69	−7.81 (5.46)	0.0001	11.2	1.51 (4.84)	0.602
Dryness	3.81	2.19	−1.62 (1.82)	0.0046	2.44	0.25 (1.72)	0.875
Sense of diminished airflow	3.75	2.69	−1.06 (2.18)	0.0723	2.11	−0.58 (1.27)	0.4375
Suffocation	2.5	1.31	−1.19 (1.57)	0.0156	1.44	0.13 (0.91)	0.500
Nose feels too open	3.38	1.69	−1.69 (1.74)	0.0024	2.0	0.31 (1.11)	0.563
Nasal crusting	2.13	1.09	−1.04 (1.66)	0.0273	2.22	1.13 (1.5)	0.125
Nasal burning	2.06	0.72	−1.34 (1.7)	0.0078	1.33	0.61 (0.86)	0.500

Abbreviations: POV, postoperative visit; SD, standard deviation.
[a]This difference is measured as the change from the first POV to last POV.

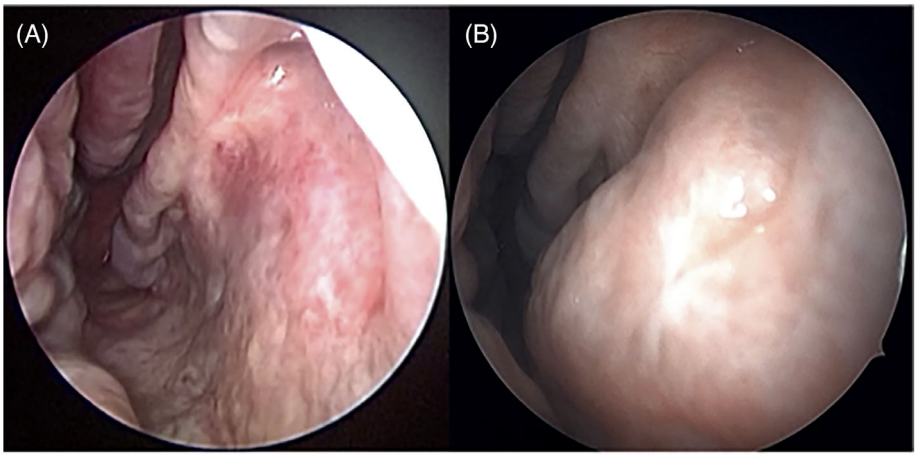

FIGURE 1 (A) Endoscopic view of the left inferior meatus (preoperative baseline). (B) Similar view shows appearance of the same region 12 months after augmentation turbinoplasty (long-term result).

(1.31 vs. 2.5, $p = 0.016$), "nose feeling too open" (1.69 vs. 3.38, $p = 0.002$), "nasal crusting" (1.09 vs. 2.13, $p = 0.027$), and "nasal burning" (0.72 vs. 2.06, $p = 0.008$) (Table 1). The final question, "sense of diminished nasal airflow" was also improved but did not reach statistical significance (2.69 vs. 3.75, $p = 0.072$).

Nine patients reported questionnaire scores at least 20 weeks after surgery. In this cohort, the average final postoperative visit (FPOV) was conducted 38.7 weeks after surgery. When examining the overall score and all subsection scores of the ENS6Q, there was no significant difference when compared to POV1 scores.

No patients suffered significant complications. One patient underwent a revision procedure for removal of grafting materials due to lack of patient reported improvement in symptoms; that procedure and the postoperative recovery were uneventful.

4 | DISCUSSION

AT using BDCM resulted in a significant improvement in overall ENS6Q scores (17.5–9.69, $p < 0.001$) as well as significant improvement in five of the six questions of the ENS6Q (Table 1). On average, patients experienced an overall improvement of 7.81 on patient-reported ENS6Q questionnaires at their first postoperative visit. This is above the minimal clinically important difference of 7 used in previously published studies.[4,5] Furthermore, the improvements in ENS6Q overall score and its subdomains demonstrated a durable effect with no significant difference between the scores obtained at patients' first and last postoperative visits.

BDCM is an appropriate grafting material that carries important advantages. BDCM is also easy to manipulate during surgery and can be easily cut and shaped to fit a wide variety of defect sizes and shapes. The recipient site also tends to heal well; of note, no cases of overt extrusion or local infection were noted in this case series. As BDCM is an allograft, there is no need to harvest graft material, eliminating additional donor site morbidity and reducing operating times. Furthermore, the resorption rate is low, as indicated by the sustained reduction in ENS6Q scores and serial nasal endoscopy (Figure 1). Lastly, if a patient requests a revision procedure, surgical removal of BDCM graft material months after placement is

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feasible with sharp instrumentation, including microdebrider blades.

Furthermore, while no cases had complications related to surgery, one patient did undergo a revision procedure to remove the grafting material. This instance illustrates the limitations of preoperative cotton testing as the foundation for planning intraoperative grafting. For this reason, patients should be counseled on the possible need for refinement procedures. Fortunately, BDCM grafts can be easily removed in a second surgical procedure. However, it is essential to wait at least 4–6 months before reversing the IT procedure to ensure adequate time for wound healing and to allow patients time to assess their new baseline nasal airflow.

Limitations of this study are related to the relative rarity of ENS patients. While the sample size was limited, it is similar to other single-arm studies of ENS. Furthermore, as with many studies looking at the ENS population, patients present from multiple locations making adherence to a strict follow-up schedule difficult. This results in some loss of homogeneity of the patient data and negatively impacts patient follow-up. Further investigation utilizing a prospective study design with larger cohort and longer follow up will be needed to provide more definitive results and to potentially compare its effectiveness to other implant materials.

CONFLICT OF INTEREST STATEMENT

M.J.C. serves as a consultant for 3-D Matrix, Acclarent, Lynx MD, Medtronic, and Neurent. The remaining authors declare they have no conflicts of interest.

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